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ABSTRACT

A study using microcomputers for instruction in sentence-building skills with two groups of American Indians in bilingual education programs found computer-assisted instruction to be effective in developing differential skills in the different age groups. The method used small group activity at the computer, emphasizing the cooperative learning environment preferred by Native American students, and encouraged the students to create their own fonts on the computer as a means of focusing attention on the task. Same-age and older-younger peer interaction was observed and recorded. It was found that the students were willing to spend the necessary time on the task, and communicated with the instructor and with peers about it. Older students were found to show more learning initiative than younger students. It is concluded that the use of computers for developing and holding interest in language skill learning holds potential for a group culturally predisposed to negative attitudes about language learning and lack of language proficiency. (MSE)

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SENTENCE BUILDING WITH A MACINTOSH MICROCOMPUTER

ABSTRACT

Through a pilot study in building sentence skills, we have sought to demonstrate effective classroom language learning for Native American students based on a rationale for enhancing learning utilizing a Macintosh computer and instituting a cooperative learning environment. The students in our study are in multi-graded (grades 3 - 8) bilingual Hupa/English or Yurok/English classes; the classes are held in two public schools on the Hoopa Indian Reservation. Results showed that the project was effective in two ways: all of the students completed the sentence-building task, and the older students evidenced language proficiency more advanced than the younger students. In a theoretical discussion, an explanation for the results is provided in terms of language development in a cultural context. The classes in the study are laboratory classrooms within the Bilingual Emphasis Credential Program at Humboldt State University, and included University credential candidates as participants.

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Equipment Needed for Presentation:

Apple Macintosh 512K Computer System, External Disk Drive, Imagewriter Carousel Projector for showing 35 mm. slides

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Studies of how Native American children learn language have focussed on stages of language development, and have sought to identify features that change as children grow older. Whereas early research on child language development focussed on changes in grammatical usage, (W.F. Leopolld, 1949; S. Ervin-Tripp, 1973; H. Dulay and M.K. Burt, 1974) Developmental research with Native children has been more recent, concerned with identifying features associated with communicative competence (K. Watson-Gegeo & S. Boggs,1977; T. Weeks, 1970; R. Bennett, 1979.) Studies of learning by Native American children in classroom environments are rare, and have focussed either on problems blocking learning or on the participant structure conducive to learning (V.P. John, 1972; S. Philips, 1972)

The study was designed to set up classroom conditions conducive to successful language learning for Native American children, to carry out a language learning task, to demonstrate learning through completion of the task, and to demonstrate development through noting differences between the older and younger students. The study is part of a bilingual education project predicated on the importance of teaching the native languages of Hupa, Yurok, Karuk, and Tolowa to children with these ancestral backgrounds. The use of the native language and English are essential in teaching language skills because teaching in the native language gives it the same stature as English in the classroom, and restores to the Indian pride in the native language. For example, when instruction is offered in both languages to strengthen sentence-building skills, good English sentences are constructed alongside good Indian sentences, and the vocabulary, grammar, and syntax are compared Discussion emphasizes the differences in grammar as well as different ways of viewing reality implied by the grammar.

The Indian languages described here are those still spoken by tribes in Northwest California: the Hupa, Yurok, Karuk, and Tolowa. These languages are extremely rich and varied communication systems, deriving from three distinct language families, (Athabaskan, Hokan, and Algonquin), and containing oral traditions that have encoded the history, governance, scientific knowledge, social mores, and literary expertise of peoples who have existed on their current tribal homelands for 2,000 and more years.

In addition to the barrier for the Indian in learning the English language due to improper past schooling, there is the fact that the American Indian languages are oral, not written, and Indians need to be introduced to concept of a written language. A comparative method is used in developing the concept of literacy, also, to develop reading and writing skills. Because we are working with people from an oral culture, we are particularly concerned with techniques that take into account the oral nature of the language of the people, and that will use the oral tradition of American Indians.

One key issue in the education of American Indian children is how to devise an approach where students will take an interest in reading and writing. In learning how to write, the child needs to build general thinking skills like concentration, memory, understanding of cause and effect, and other relationships. These concepts can be excessively abstract for the Indian child's intellect, as can the concepts of grammar involved in sentence-building in two languages, and part of the key to the success of instruction is providing concrete realization for the abstraction (P. Gonzalez, 1980) The results of our research have shown utilizing a cooperative approach with a computer can help American Indian students gain more control over their education. A computer provides interaction with the student, in the form of choices students are given to carry out a program. We have found a focus in the Macintosh Microcomputer, where learning is self-directed rather than rote, and where the graphics capabilities of the Macintosh allows for abstract ideas to be represented visually (M. Behrmann, 1984)

The cooperative nature of the project grew out of research that has shown that the nature of the participant structure is aparticularly important influence in the learning of American Indian children. (Philips, 1985; Mohatt & Erickson, 1981) In two studies of Indian students, the participants structure found to be most effective with Indian students was one that emphasized teamwork and group responsibility for a product.

One of the most important findings to emerge from recent cooperative learning research is the strong achievement gains among minority pupils in cooperative classrooms. Dramatic gains made by minority and lower status students have been documented for Black students, Asian students, students from Middle-Eastern backgrounds, and other ethnic minorities. (E. Aronson, et al., 1978; A. Klein and Y. Eshel, 1980)

In cooperative learning, students plan and carry out activities and accomplish learning tasks in groups,with groups being rewarded for the achievements of individuals within the group. Cooperative learning has begun with a way to teach social skills, but has been purported to be a general strategy for promoting higher achievement in all subject areas and covering all tasks. (D. W. Johnson & R. Johnson, 1981)

Subjects, Setting, and Rationale: This study concerns classroom language learning focusses on building sentence skills in grades 3 through 8, in ungraded bilingual classes. The students attend two elementary schools on the Hoopa Indian Reservation; both schools are in a rural environment, the school housing the Hupa bilingual class is situated in a town of 1700 persons, whereas the Yurok bilingual class is situated between two Yurok villages and operates only on generator-power. The study was designed with the rationale that for language development to occur, there must be an enhanced learning environment and an appropriate participant structure

All of the subjects in this phase of the study were from American Indian families, primarily of Hupa and Yurok ancestry. They were 91 children ranging from third grade through eighth grade, from two schools on the Hoopa Indian Reservation who were participating in the University's Bilingual Education Program by parental consent. Almost all of the children were born and lived all of their lives on the Reservation, a rural environment in the coastal mountain ranges of northern California. One of the schools is situated between two ancient Indian villages still occupied today, but is a considerable distance from a modern town. This school runs on generator-powered electricity. The other school is situated in a town of 1700 persons. Some of the children, particularly those attending one of the schools, come from homes without electricity, running water, and other modern conveniences. The children live, for the most part, in extended families that comprise villages with several households.

The students enrolled in the bilingual program of instruction ranged in age from seven to fourteen and received instruction as a multi-graded class. In the Macintosh computer project, they met on a weekly basis during one school year. Three students studied together on the computer with an adult bilingual instructor determining order of turn-taking (who was to be in each group was negotiated with the regular classroom teacher; the order of typing on the computer was determined by the adult bilingual instructor.) The computer groups received the only regular cooperative

bilingual instruction; there was other small group at the schools, such as with reading groups, but these groups were either elicited bilingual instruction or monolingual English instruction. (By elicited, I mean that students' participation is comprised of answering instructor's questions; elicited learning contrasts with the cooperative project, where the focus is on the students' shared responsibility for completing a project with the instructor acting as resource in learning; in this case, students work together to produce a common product.)

THE TASK

The task was structured keeping in mind two key features found to be effective with Indian students:

Enhanced learning environment: for American Indian students, it is important that the students feel that they are actively involved in the education process, rather than feeling that something is being foisted on them. The Macintosh encourages development in reading, for example, because it offers the opportunity to create phonetic fonts. In this study, students were encouraged to choose the size of fonts, the styles of fonts, and were given other choices. We hypothesized that having to make these choices would focus their attention to the task, and that their sentence-building skills would improve through this attention. Further, the Macintosh computer itself is an object of interest to these rural students, and its relative ease of use makes it accessible to all age levels in the study. this focussing These classes consist of a cooperative learning project using a Macintosh microcomputer to practice sentence-building in two languages: the native languages of Hupa or Yurok, and English.

Appropriate Participant Structure: since research has shown that Native students prefer cooperative learning environments, the task was designed for cooperation, with three of the students working with one adult instructor on the computer at the same time. Older students were given the opportunity offer help, whereas younger students had the opportunity to ask for help.

The nature of the task was as follows:

In this study, three students cooperated in making pages in a Natural

Resource Dictionary. The Dictionaries consisted of entries for plants and animals known in the Northwestern California Indian world. Most are used by Indians in carrying on the Indian lifestyle. A series of plants is used for basketmaking, for example. Each week, they worked on their page, consisting of a dictionary entry referring to a plant or an animal, named in the Indian language, named in English, and defined in both languages. Definitions were conceived by the children based upon their knowledge about the animals or plants. Translation was supervised by Hupa and Yurok bilingual teachers.

No separate instruction was given for operating the computer apart from the task at hand. The computer project instructor taught them the use of the computer by telling them what they needed directions for accomplishing the dictionary task. Children were shown a series of pictures of animals or plants and told to compose a sentence describing what they knew about them. Children were requested to compose "good" English sentences and "good" sentences in Hupa or Yurok. The Hupa/Yurok sentences were also literally translated into English. Students were then requested to illustrate their sentences and were shown how to use the Mouse and the MacPaint software program to do illustrations.

The cooperative nature of the project emerged from the way the pages developed, and was made possible because choices were left to the children. Choices came up in connection with the design of the pages, and since more than one child's entry occupied one page, questions of layout, printing style, printing size, and questions pertaining to illustrations were group decisions. We were interested in determining how the cooperative nature of the project affected its outcome, as well as on changes brought about by the decision-making process. There were basically two types of peer interaction:

1) older students with younger ones
2) students of the same age with each other

Care was taken to record data representing the entire range of the interactive event, and observations were in the form of audio-tapes, video-tapes, and written notes. Observations were also recorded outside of the interactive event, such as during lunchtime, recess, and during other out-of-classroom events, for the purpose of determining the "typicality" of the cooperative behavior observed during the microcomputer sessions.

Observational records resulted in documenting the nature of the children's interest in the project, and their faithfullness in pursuing the dictionary project over a period of months until it was completed. Finally, we were interested in determining whether there were differences in the nature of the learning between the two types of peer interaction, i.e., whether there were differences between peer interaction involving older and younger students as compared with peer interaction between students of the same age.

Results: Results showed that the students were willing to spend the time on the task necessary to complete it; they worked on the project willingly once a week for an entire school year. Results showed also that the students took advantage of the cooperative nature of the project to communicate with each other and with the instructor. Since older and younger students worked together on individual sentences, development was evidenced in the spontaneous utterances of the students, rather than in the sentences themselves. It was found that older students were more likely to offer than to ask for help, more likely to ask questions on the topic of the instructor, and more likely to prepare material for the dictionary on their own initiative without being asked by the instructor

Typically, in Indian classrooms, children lose interest in language-related tasks in school as they proceed to upper grade levels, when interest is defined as something initiated the children themselves. Until approximately the third grade, the children are at a stage in language development where they need assistance in designing and executing a task. From the fifth grade on, demonstrated interest appears to wane, they are less likely to accomplish language-related tasks on their own initiative. Children in the bilingual education classes, in contrast, show a marked increase in interest in language.

Regular observation of students from third through sixth grades showed that children in the bilingual computer project were more likely to volunteer to participate than students in other language activities, more likely to complete the task, and more likely to bring their own ideas to the task. Regular observation of students in seventh and eighth grade showed that bilingual students were significantly more likely to ask questions about language, more likely to offer help for younger students, more

likely to put their own ideas into a project, and, finally, they are more likely to tell others about the project.

Demonstrated interest was identified in six different areas.
A comparison of the average number of signs of demonstrated interest by students in the bilingual computer class as compared with monolingual instruction in language is depicted in Table 1. As this Table demonstrates, students in the bilingual project increased their average signs of interest as they proceeded to higher grade levels, whereas the students in monolingual language instruction showed a lower curve of interest throughout grades 3 to 8, and a tendency to decrease interest after grade 5.

A comparison of younger and older children is presented in Table 1, where the younger group are grades 3-6 and the older group are grades 7-8. The signs of demonstrated interest are given in six areas, with the younger group showing more interest than the older group in one area: Asking for Help, (.59/.18) and the older group showing the most marked difference in three areas: Completing the Task, (.57/.99) Bringing Ideas to the Task, (.47/.91) and Offering Help (.11/.62) The two groups as a whole demonstrated most interest in areas relating to Completing the Task (average .78) and Bringing Ideas to the Task, (average .54) and least interest in one area: Asking Questions about the Topic (average .25).

In explaining why the students expressed a higher degree of interest in the computer project, the cooperative nature of the project and the opportunities for self-initiated actions (rather than elicitation and response) appeared in almost all of the six Ways of Demonstrating Interest. A major part of the cooperation between the children occurred in two areas: Asking for Help and Offering to Help; a major part of the self-initiated activity occurred in the area of planning. Older children evidenced planning their dictionary pages in advance, as well as thinking on the spot of unique layout, printing and font-size combinations, and ways to illustrate their page.

Making choices was another important aspect of building interest, and is a type of self-initiated activity. Students had to make choices to carry out the project. The choices they were given were: the choice for participation in a group, the choice of order for their turn at the computer, the choice of dictionary entry, choice of font, style, size, and other aspects of layout, and finally, the choice of illustration.

Table 1

DEMONSTRATED INTEREST IN BILINGUAL COMPUTER PROJECT AS COMPARED WITH MONOLINGUAL TASKS

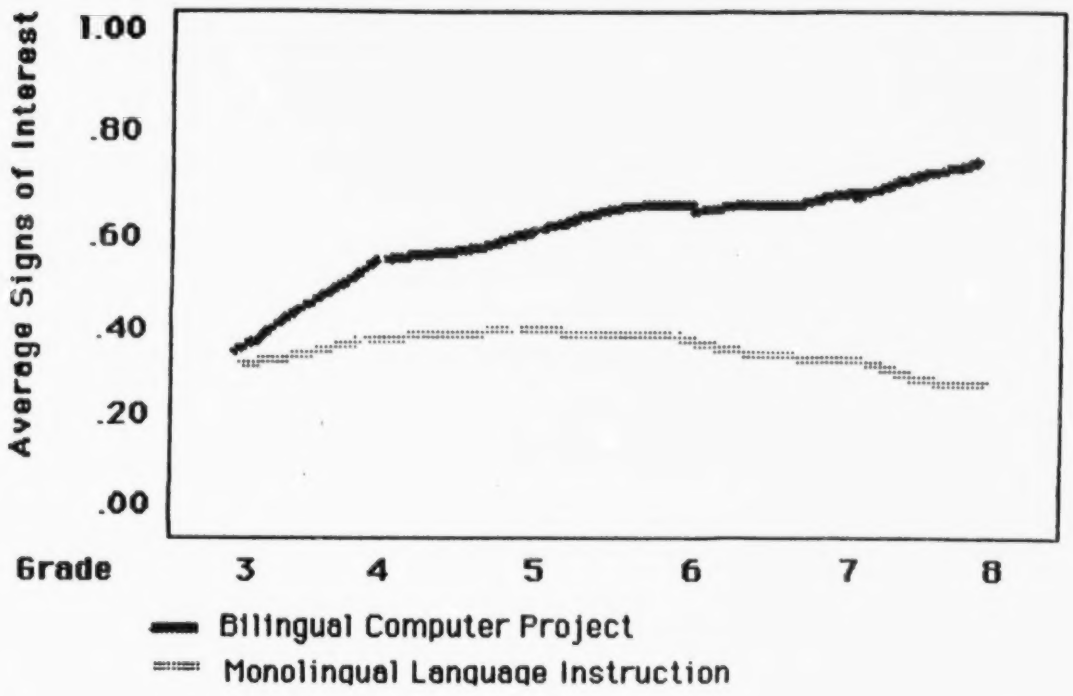

Table 2

Typical Ways of Demonstrating Interest in Co-op Computer Project

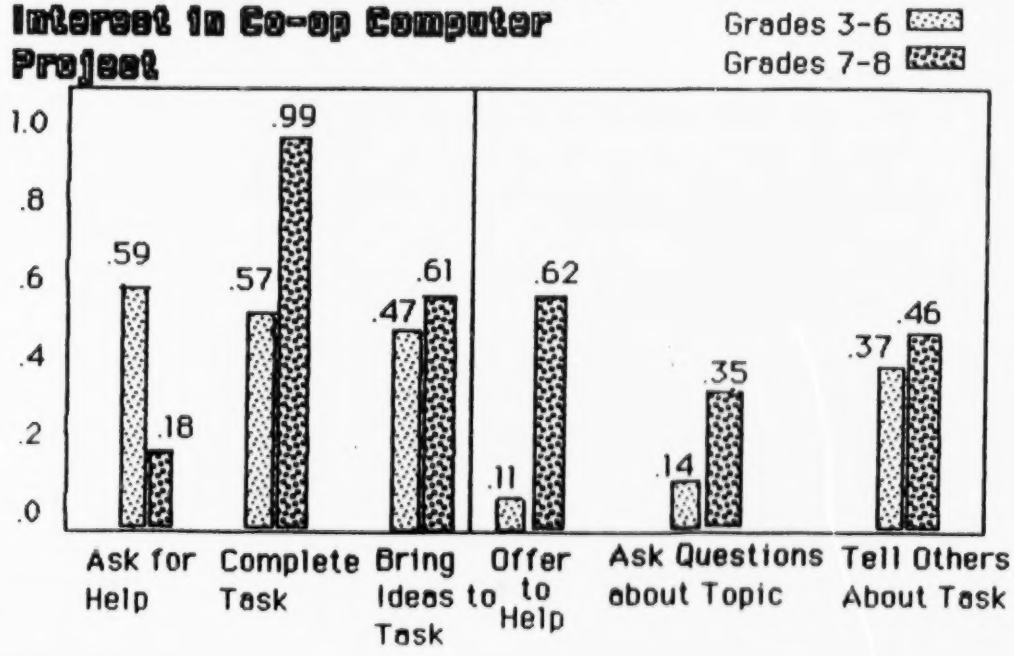

Table 1 demonstrates that when given choices, students in the cooperative learning groups were more likely to chose task-oriented actions than not to participate, and further, that the percentages of task-oriented actions increased as the children grew older. In terms of demonstrated interest, the project was able to capture and keep the children's interest; as their ability increased, their interest maintained or increased also.

The dictionary task involved certain skills directly related to language. Some of the various skills involved in the dictionary task are described below:

1. Computer skills: typing, word-processing, manipulating the mouse (for drawing pictures), layout, keeping files

2. Writing: defining, sentence composition (grammar and syntax)

The definitions chosen by the students allowed for practice with different sentence types. First, word order of both Yurok and Hupa are different from each other, and each is different from English. Second, grammar for each of the three languages is different as well. Third, sentences do not translate literally from a Good English sentence to a Good Yurok/Good Hupa sentence. Only free translations generally are good, so that students gained practice in defining words as closely as possible to their equivalent in another language.

Some examples of Yurok and Hupa sentence patterns with their literal and free English translations are listed below:

VERB FINAL SENTENCES:

MOKEP P∃RK∃RM LΔKΛMΔ
salalberry jars you put
You put salalberries in jars when making jelly.
[Yurok]

M†NOXWE K†GEↃ J†TON
raccoon strawberry he eats
Raccoon eats strawberries.
[Hupa]

Be Verb Deletion

KWΔCPEN CKƟ WƟNEPƟ
strawberry good to eat
Strawberries are good to eat
[Yurok]

ƆWO' M†KE' N†TEL
beaver tail wide
Beaver has a wide tail.
[Hupa]
Noun-adjective Order

KWΔCPEN CKƟWULUNI PΛPCƟ
strawberry tastes good bread
Strawberry shortcake tastes good.
[Yurok]

M†NOXWE M†NOXE ⊟†W†N
raccoon its eyes around black
Raccoon has black markings around its eyes.
[Hupa]

3. Translating: transcribing, free and literal translating, translating from English to an Indian language, and from an Indian language to English

4. Social skills: turn-taking, helping younger child, taking advice from other, making choices, carrying out task with group responsibility

In this study, younger and older students were treated as members of one class, and when younger students stopped short of completing a phase of the task, they were advised by older students. The teacher behavior of older students was another behavior observed significantly more in the bilingual classes.

THEORETICAL EXPLANATION

Cooperative learning methods have been around long enough for some of the early results to be questioned. The initial Johnson & Johnson studies,

for example, have been criticized for being too general, and not related to task type. Factors in cooperative learning, such as the role of individual achievement in group rewards, peer groups vs. ungraded, multi-age groups, and other learning factors have attracted the attention of researchers more recently. One interesting finding in recent attempts to refine the analysis has lead researchers to the conclusion that individual accountability is a critical factor for gains in individual achievement. (R.E. Slavin, 1983) Further, group rewards based upon individual achievement are more successful in producing achievement gains than either individual groups or one conglomerate group grade. Results of numerous controlled studies of cooperative learning that it has positive effects for academic achievement, and it also has positive effects on cooperativeness and ethnic relations among students. (S. Kagan, 1986) Thus, cooperative learning addresses some of our most pressing national educational problems. In sum, cooperative learning is somewhat unique as an innovation for training teachers as it is not content-specific nor limited to one subject area. Yet, it promises to be highly effective as a teacher training tool since it is congruent with traditional American Indian education.

Cooperative learning that offers a balance between individual and group holds promise for the schooling of American Indian students especially when the cooperative learning model maintains the patterns of education that predominate in American Indian homes. . (S.T. Boggs, 1985) One important finding is that forcing children to maintain a one-to-one question-answer dialogue with an adult teacher, where not knowing the answers to many of the questions may violate the Indian child's notion of self- respect. The child's sense of worth as an American Indian may be threatened if he speaks, thus creating a situation where the child feels it is impossible to verbalize. This is one source for the "silent Indian" syndrome. (R. Dumont, Jr., 1985) Other features of cooperative learning that appeal to patterns in American Indian culture have to do with participant learning structures. Important research has been done documenting the fact that American Indian children respond in school according to norms governing communicative performance in the communities from which they come.

Indian norms have been found to be fundamentally democratic and respectful of individual growth, and Indian students have been found to have difficulties in achieving because of the prevalence of competitive

norms in school. Since Indian children exist in this larger society and depend upon the larger society for their survival, it is important that they learn basic skills in a way congruent with their home training, before they are thrust out into a world where they are hopelessly outnumbered and which offers no adaptation to their needs at all. Cooperative learning offers supervised, group participation.

Silent listening and watching is predominant in Indian culture in a fairly complex nature, and cooperative learning allows younger children the chance to observe. In the Indian home, young children are required to watch and listen for extended periods of time; rather than being periodically tested by an adult, they are expected to try out the skill they have observed, to test themselves until they are successful in a diversity of situations, and then to show the results of that success publicly, as a sort of performance. Indian people have in general very large families and are frequently in group situations. In these situations, Indian children may be supervised by adults, but are more likely to learn from older children, than to query adults. In one important study, gradually the child came to learn all of the skills involved in a particular process, consistently with older children controlling and directing the interaction.(S. Philips, 1985) The emphasis on observation in Indian culture is an important bridge to written language because there is constant practice with "seeing" and written language is a visual phenomena.

In our study, we focus on one important aspect of written language: sentence building. The first step in sentence-building is the alphabet. The Macintosh allows for installation of fonts containing sets of letters in alphabets; the Hupa, Yurok, Karuk, and Tolowa languages are written in the Unifon Phonetic Alphabet, an orthography developed especially for computers and installed for the first time in the Macintosh. (J. Culkeen, 1971) Beyond the alphabet, the Macintosh computer has a visual emphasis that makes it "user-friendly:" information for locating files is encoded on pictures called "icons," control operations are also visual images, being encoded as pull-down menus; the Macintosh has graphics capabilities for illustration that goes beyond drawing alphabet sets combining a variety of lines and patterns; word-processing and graphics can be accomplished with the same software.

The visual nature of the Macintosh makes it particularly appropriate as a learning tool for Indian children. We were able to find concreteness in the Apple Macintosh computer, with an information system uniquely suited to the instructional needs of American Indian students. (J. Sculley, 1986) The rationale for using a visual approach in teaching language skills is to be found in an understanding of intellectual growth for the Indian child that is rooted in personal experience, and where new knowledge is gained within the context of that experience. Similarly, the rationale for a cooperative learning participant structure is culturally based; just as, as we pointed out earlier, the comparative bilingual method of presenting two languages of instruction has a cultural rationale.

This process of all intellectual growth, as Piaget has pointed out, is a process of developing from a self-centered world where expression of immediate desires is primary to a world of socially agreed upon meaning. In the course of his psychological investigations, Piaget postulated four stages of intellectual growth, beginning with the sensorimotor, through the pre-operational, then the concrete operational, to the formal operational. Piaget's reasoning led him to the contention that children pass through these stages, and that they become increasingly more abstract in their thinking abilities through an increasing sophistication in the use of symbols. Language, for Piaget, is a crucial focus for symbolic thought since it is through language that the child learns to express himself/herself, accommodates to the demands of his environment, and modifies his behavior accordingly. Since language is one area where cognitive and social development occur within one process, Piaget conducted research on acquisition of formal logic through having children retell narratives. (J. Piaget, 1926) He concluded that those children who could retell a story with the same sequence were demonstrating logical thought and were more advanced than children who would vary the sequence. There has been a need to go beyond Piaget to develop the flexibility to take account of cross-cultural differences.

We are concerned with developing an approach to sentence-building that takes into account the prior cultural experience of the American Indian. Looking at the cultural basis for thought patterns builds on earlier work of linguistics and sociology. As early as the beginning of the present century Durkheim assumed that the basis process of the mind originate in society, and linguists such as Whorf and others have postulated degrees of

relationships between language structures and thinking. Of particular relevance with the American Indian is the oral nature of the thinking patterns. Research has shown that oral thinking patterns may be significantly different from thinking patterns derived from written models for thought. Research occurring in Russia with non-literate people was conducted by Luria, a contemporary of Piaget, but the findings were not known until the 1970's. (A.R. Luria, 1976) Luria's investigations showed that nonliterate peoples follow rules that ressemble the stage of concrete operations, and that these people actually avoid abstract reasoning, seemingly because they place priority on their immediate sensory experiences, and on their graphic recollections of these experiences.

When asked a hypothetical question that required syllogistic reasoning, Luria's adult subjects repeatedly refused to accept the premises of the syllogism, preferring instead to rely on their personal experience. Their conversation abounded with graphic images, suggesting that these images were recollections, and that their recollections of vivid experiences were the source for their judgments rather than the logic of propositions. One implication for the education of oral peoples is that they simply will not be reached until the institution can meet them on their own terms and provide instruction where learning is based upon concrete experience.

The Russian rural people in Luria's study have their counterparts in the American Indian people of today. Although the people lived for thousands of years in an ancient oral culture, radical changes in the economy have led to the development of a high-tech society where the elimination of illiteracy is demanding a genuine revolution in cognitive activity. The old social rules for following the dictates of common sense cannot take into account the overabundance multi-media information that influences us in American society today. Almost every profession relies upon abstract thinking skills because there are too many diverse experiences relevant to making choices for any one person to be able to make judgements solely on personal experiences. One of the results of literacy is that people learn how to think more abstractly, because they learn to make judgements on the basis of general knowledge gained from what they read.

Methods for developing abstract thinking abilities to improve the social and economic life of oral peoples such as the American Indian are most urgently needed. Over the past 15 years, we have developed such a method

of instruction that makes the transition to literacy by emphasizing concrete experiences, relies on graphic images, takes into account the context of thought, and focuses on a comparative method of learning two languages in understanding how language is put together.

Conclusion: The discussion concerns the need for new solutions for educating Native American people. This need grows out of a complex political history where the lifestyle of these indigenous people was encroached upon, resulting in negative attitudes toward language learning, as well as lack of language proficiency. The solution we propose for retraining such a population is unique, and in seeking a solution within bilingual education, we have emphasized peer interaction in a cooperative learning environment, as well as instruction in both the native language and English. Instruction with the Macintosh computer was found to be a ready focus of attention for Native students, an excellent way to make the learning of the language contemporary, and to provide skills appropriate for students thinking about a future in professional life.

Bilingual education is a needed form of education in states like California where over 55 American Indian languages alone have been identified, and the bilingual population extends throughout Euro-American (notably Hispanic) and a diverse Asian population as well. In the past five years, the State Bilingual Teacher Grant Program has supported the training of approximately 500 teachers, with an estimated need for training 23,000 more.

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